1. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

   Uranium is taken out of the reactor with a temperature of 200° *C and is placed into a* 20° *C bath to cool. After 30 minutes, the uranium has cooled to* 139° *C.*

   A. $k = -0.01731$

   B. $k = -0.02572$

   C. $k = -0.02529$

   D. $k = -0.01379$

   E. None of the above

---

2. A town has an initial population of 100000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	100000	99965	99945	99930	99919	99910	99902	99896	99890

   A. Linear

   B. Non-Linear Power

   C. Exponential

   D. Logarithmic

   E. None of the above

---

3. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's

temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 150° *C and is placed into a* 20° *C bath to cool. After 18 minutes, the uranium has cooled to* 91° *C.*

A. $k = -0.04036$

B. $k = -0.04155$

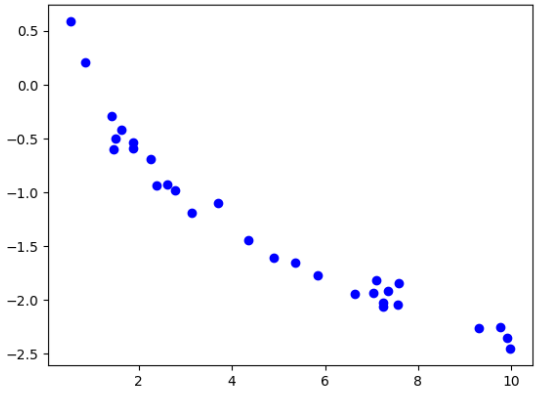
C. $k = -0.03360$

D. $k = -0.03940$

E. None of the above

---

4. Determine the appropriate model for the graph of points below.



A. Exponential model

B. Logarithmic model

C. Linear model

D. Non-linear Power model

E. None of the above

---

5. Using the scenario below, model the population of bacteria α in terms

of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 1 hours, the petri dish has 14 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

A. About 47 minutes

B. About 32 minutes

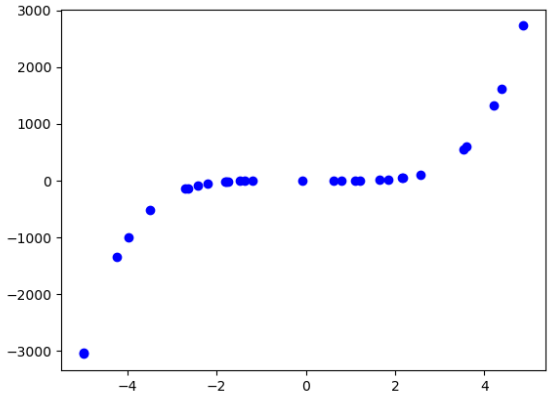
C. About 282 minutes

D. About 197 minutes

E. None of the above

---

6. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Linear model

C. Exponential model

D. Logarithmic model

E. None of the above

---

7. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

   The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 606 grams of element X and after 4 years there is 75 grams remaining.

   A. About 365 days

   B. About 365 days

   C. About 1 day

   D. About 1825 days

   E. None of the above

---

8. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

   The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 908 grams of element X and after 7 years there is 113 grams remaining.

   A. About 1 day

   B. About 1095 days

   C. About 3285 days

   D. About 730 days

   E. None of the above

---

9. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 3 hours, the petri dish has 147 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

A. About 74 minutes

B. About 207 minutes

C. About 34 minutes

D. About 449 minutes

E. None of the above

---

10. A town has an initial population of 80000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	80080	80320	81280	85120	100480	161920	407680	1390720	532288

A. Linear

B. Logarithmic

C. Non-Linear Power

D. Exponential

E. None of the above
